

OVERVOLTAGE-PROTECTION DEVICE

The invention relates to an overvoltage-protection device, applicable in particular to the low-voltage mains.

For the protection of a consumer circuit supplied from the low-voltage mains (below 400 V, for example), it is usual to use, between the two lines of a 50 or 60 Hz AC mains, a varistor of metal-oxide type, especially of zinc-oxide type, mounted in series, on the one hand, with a thermal-fuse circuit-breaking element, and, on the other hand, with a gas-discharge arrestor. Figure 1 represents a diagram representative of such a device. Between the lines 1 and 2 of the mains, the right-hand part of which is to be protected against overvoltages, are mounted in series a gas-discharge arrestor 3, a varistor 4 and a thermal-fuse element 5 subjected to the tension from a spring 6 tasked with ensuring effective disconnection after the element 5 blows.

Such a device theoretically operates in the following way: the gas-discharge arrestor 3 withstands practically the entire AC voltage of the mains. In effect, the stray capacitance of the arrestor 3 is of a few picofarads whereas the stray capacitance of the varistor 4 is of a few nanofarads. When an overvoltage occurs, it causes the striking of the gas-discharge arrestor 3, which can only be extinguished if the current, called secondary current, which passes through it subsequently becomes sufficiently small. It is the resistance of the varistor 4 which causes the limiting of the secondary current and allows the gas-discharge arrestor 3 to be extinguished.

When an overvoltage-protection device has operated a certain number of times, its components reach the end of their lives. In the case of a gas-discharge arrestor, the end of life corresponds to short-circuiting. In contrast, in the case of a varistor, the end of life is manifest as an explosion.

As a safety measure, the gas-discharge arrester is designed so that its ability to carry away the energy pulses relating to the overvoltages is less than that of the varistor. In this way, it is the gas-discharge
5 arrester which arrives first at the end of its life and which becomes short-circuited.

The voltage of the mains is then transferred fully onto the varistor 4, which heats up and entails the blowing of the thermal-fuse element 5 and the
10 thermal disconnection, that is to say the placing out of service, of the protection device.

Such a device operates satisfactorily, but only within a limited range of voltages. This is because, in order for the varistor effectively to ensure the
15 extinction of the gas-discharge arrester, its rated voltage has to be very close to that of the mains. Moreover, if the rated voltage of the varistor is too high, the heating necessary to trigger the thermal disconnection will not be reached and the safety of
20 operation of the device will not be ensured.

The object of the invention is to propose an overvoltage-safety device which can operate in a wide range of voltages, for example between 180 and 330 V, in order to be able to fulfill its role in practically
25 all the countries of the world.

Another object of the invention is to propose an overvoltage-safety device in which the function of extinguishing the gas-discharge arrester is dissociated from the thermal-disconnection function.

The subject of the invention is an overvoltage-protection device, applicable in particular to the low-voltage mains, comprising, between the two lines of the mains, a gas-discharge arrester, a varistor and a thermal-fuse element tasked with ensuring the thermal
30 disconnection of the device, characterized in that it includes, in parallel with the varistor, a resistor causing, after the short-circuiting of the gas-discharge arrester, the heating of the thermal-fuse
35

element so as to trigger the thermal disconnection of the device.

Advantageously, the overvoltage-protection device is applicable to the low-voltage mains in a wide range of voltages. The varistor is defined so as to extinguish the gas-discharge arrester up to the maximum voltage of use, and the resistor is defined so as to trigger the thermal disconnection of the device at the minimum voltage of use.

Other characteristics of the invention emerge from the description which follows, given with reference to the attached drawing, in which:

- figure 1 is a diagram representative of an example embodiment of an overvoltage-protection device of known type;

- figure 2 is an exploded view of an embodiment of a group of varistors mounted in parallel;

- figure 3 is a diagram representative of an example embodiment of an overvoltage-protection device according to the invention.

Figure 2 represents an assembly of four varistors 11, 12, 13, 14 mounted in parallel, separated by electrodes 15, 16, 17 and held between two strips 18 and 19. Advantageously, the gas-discharge arrester is mounted on one of the two strips, and the thermal-fuse element is mounted on the other.

In figure 3, the same elements as in figure 1 bear the same references. According to the invention, a resistor 7 is mounted in parallel with the varistor 4. This resistor has a value of a few hundred ohms, for example 400 ohms.

In the case in which the varistor 4 consists of an assembly of several varistors in parallel, as in figure 2, one of the varistors (11) can be replaced by a resistor 7 of the same dimensions. This resistor 7 may be fixed, or have a negative or positive temperature coefficient. Its purpose is to cause the heating which will trigger the thermal disconnection by way of the thermal-fuse element 5, so as to put the

device out of service after the end of its life, that is to say the short-circuiting of the gas-discharge arrester 3.

5 Thus, in an intended range of operating
voltages between 180 and 330 V, for example, the
varistors will be defined so as to extinguish the gas-
discharge arrester up to the maximum voltage of use
(330 V), while the resistor will be defined so as to be
10 able to trigger the thermal disconnection at the
minimum voltage of the operating range (180 V).

The arranging of the resistor 7 in parallel
with the varistor 4 makes it possible to separate the
two functions: extinguishing of the gas-discharge
arrester, and triggering of the thermal disconnection.

15 Throughout the description, the expression gas-
discharge arrester has been used. This expression also
covers the notion of air-gap arrester, of surge
arrester or of lightning arrester.